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## The Maryborough Earthquake of 1947

By

O. A. JONES, M.Sc., Officer-in-Charge

University of Queensland, Seismological Station

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# THE MARYBOROUGH EARTHQUAKE OF 1947

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O. A. JONES, M.Sc. Officer-in-Charge.

*University of Queensland Seismological Station.*

## INTRODUCTION.

Shortly after 8 p.m. (Eastern Australian Standard Time) on June 11th, 1947, there occurred the third earthquake shock of notable magnitude in Queensland and the first to be recorded by seismographs within the State.

The only previous shocks of sufficient magnitude to cause widespread comment were those of June 7th, 1918, and of April 12th, 1935. The Gayndah Earthquake. The little available information concerning the former was set out by Hedley (1925), and a full account of the latter was given by Bryan and Whitehouse (1938) and referred to by Bryan (1936).

The tremor of June 11th, 1947, was considerably less in intensity than either of the earlier ones.

## SEISMOLOGICAL RECORDS.

The University of Queensland Seismological Station was established in September 1937, and the Maryborough Earthquake was the first from the State of Queensland recorded by the station.

The record reads:

Phase	U.T. H. M. S.	Unit	Remarks
ePN	10-03-48	B	
iN	03-55	„	
eSNE	04-14	M-S	$\Delta = 2^\circ$
iNE	04-26	„	H = 10-03-13
iN	04-37	„	Epicentre near
iNE	04-49	„	Maryborough, Queensland

As the onset of neither P nor S was sharply defined, the time at the epicentre, H, may be as much as two seconds out in either direction.

The distance of the epicentre from Brisbane, 2°, shows that the epicentre lies somewhere on the circumference of the circle shown in text-figure 1.

The tremor was not recorded by any other station in Australia or New Zealand. Thus to fix the position of the epicentre more closely information from other sources must be used.

### COLLECTION OF EVIDENCE.

In the two days following the earthquake copies of a questionnaire were sent to over 150 post-masters, railway station-masters, headmasters of schools, lighthouse keepers, etc., in the area which reports indicated were affected by the tremor. Over 80 replies were received.

The intensity was assessed for each before looking at the localities from which they came.

### USE OF THE MODIFIED MERCALLI SCALE.

For assessing the Gayndah earthquake of 1935 Bryan and Whitehouse used the Rossi-Forel scale, but pointed out (p. 109) that it was not easy to apply it to Queensland conditions—sparse population, buildings largely of wood and not concentrated, etc.

For the Maryborough earthquake I have found the Mercalli Scale of 1931 as modified by Wood and Neumann (1931) to be very useful and easy to apply to local conditions; in particular, two of the criteria, “vibration like passing of truck” (intensity III) and “sensation like heavy truck striking building” (intensity IV), occurred over and over again in the replies to the questionnaire.

Rather curiously, of the two criteria which were found frequently in the reports of the Gayndah earthquake and which also lie within the range of intensity of the Maryborough earthquakes, *viz.* “effect was similar to a horse rubbing upon one of the house stumps” (intensity III, Rossi-Forel scale = III Modified Mercalli scale), and “the water in the tank became agitated” (intensity IV R.F. = IV M.M.), the first occurred only very infrequently and the second not at all in the reports on the Maryborough earthquake.

Bryan and Whitehouse felt that, while their determinations of the relative intensities of the Gayndah earthquake at different localities were probably correct, the absolute intensities as determined by them might be less accurate.

After re-reading some of the reports on which their determinations were based in the light of the modified Mercalli scale, I feel much more confidence than they did, that their determinations were accurate.

### DISTRIBUTION OF APPARENT INTENSITY.

Text-figure 2 shows a series of isoseismal lines, each joining those places of equal *apparent intensity*, that is absolute intensity modified by the effect of

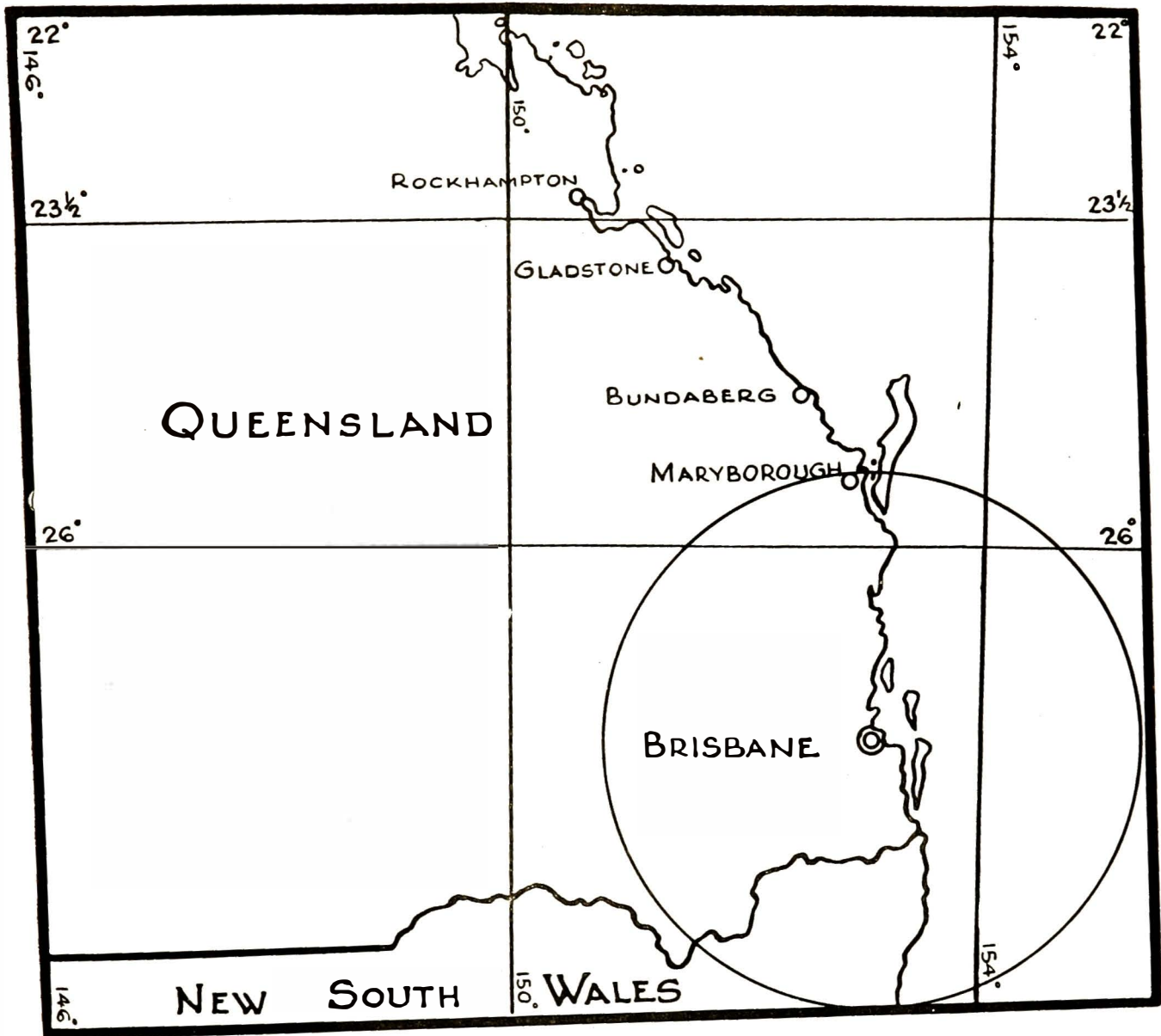
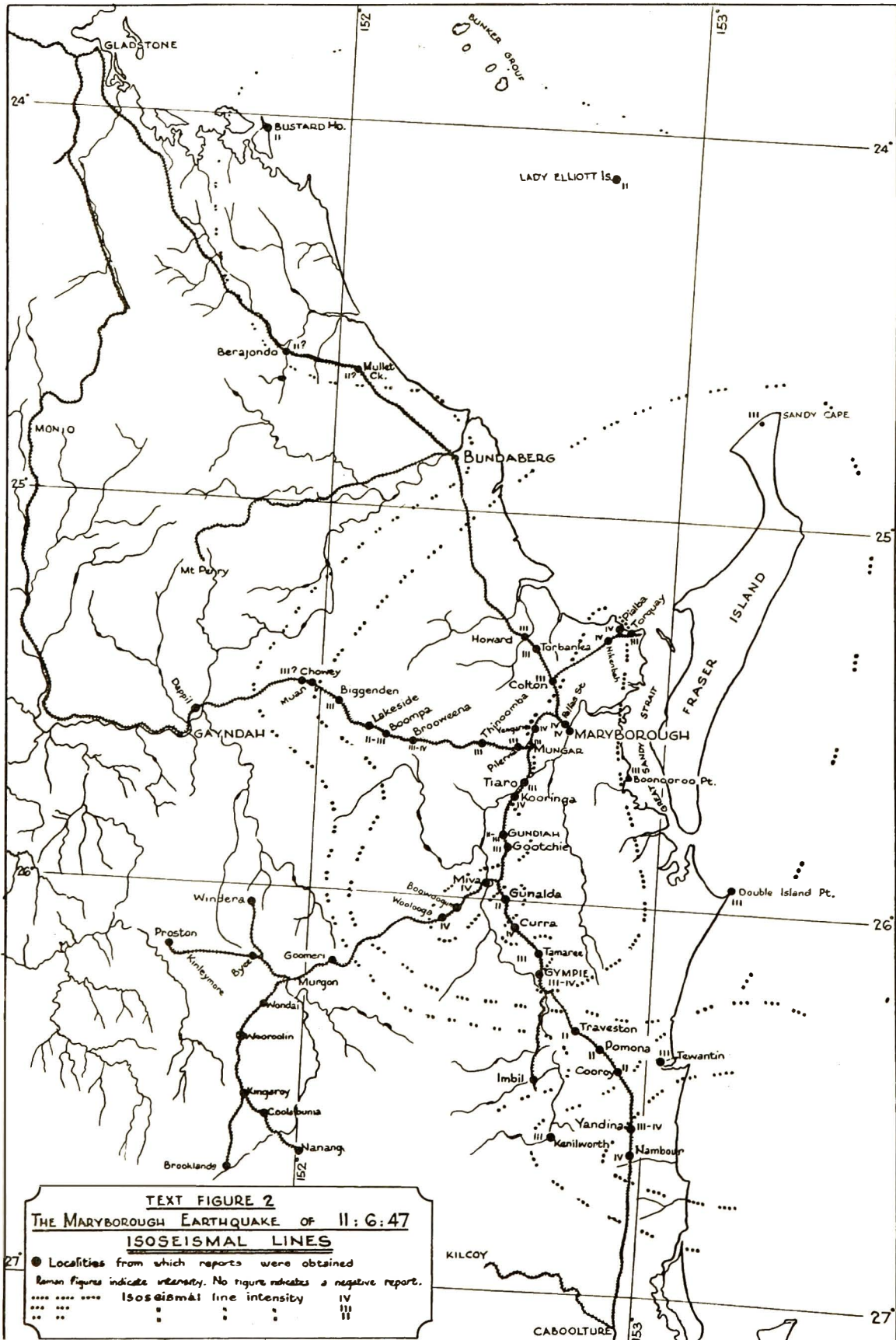
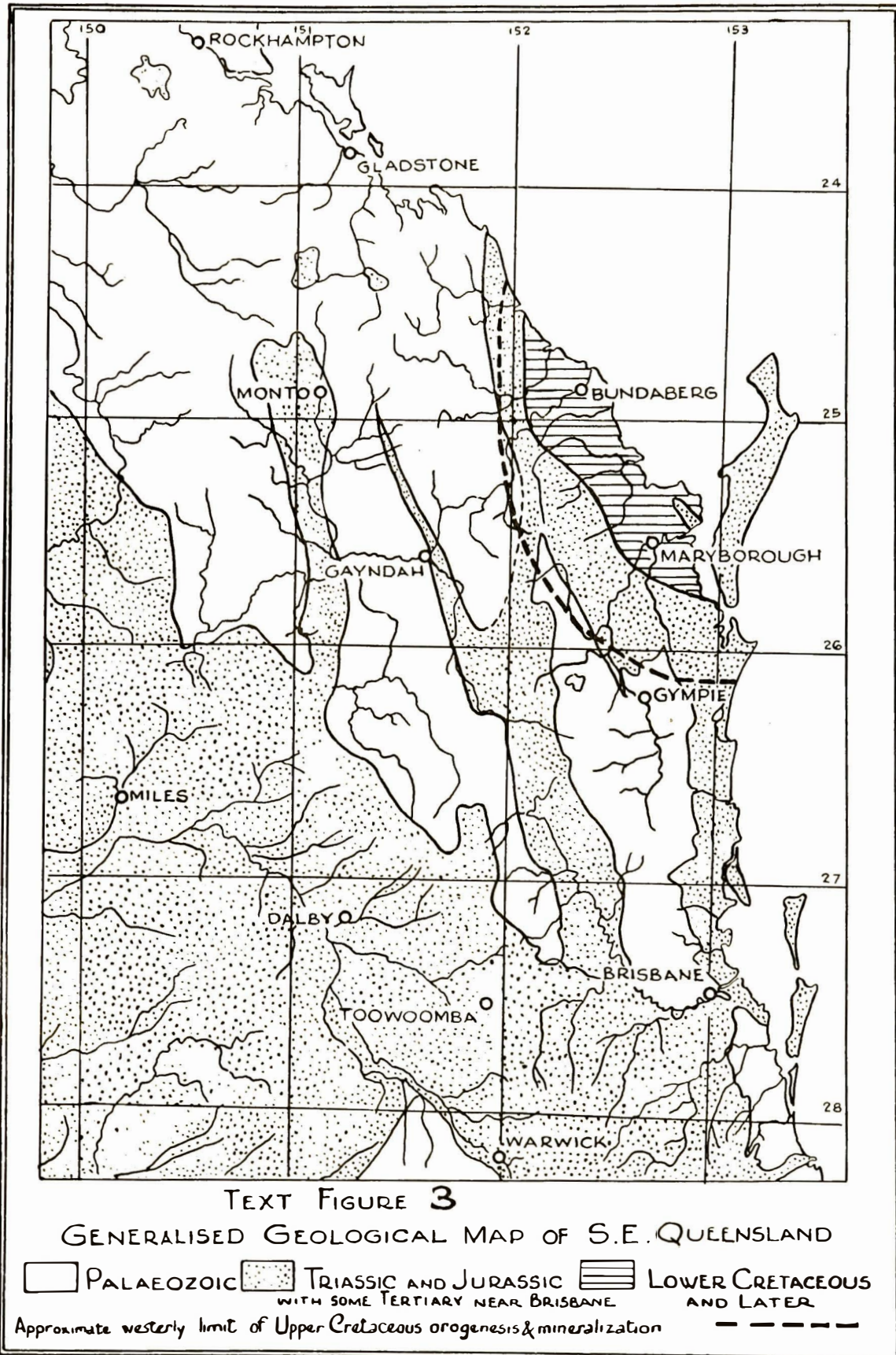


FIGURE I  
DISTANCE OF EPICENTRE  
FROM BRISBANE







local conditions. The local conditions at any particular point were to some extent taken into account in assessing the intensity but obviously it would be impossible to make full and accurate allowance for this factor.

Two reports were received suggesting that the tremor was felt slightly in parts of Brisbane, but it is assumed that these were simply coincidence as very much stronger records would be expected if the tremor had affected Brisbane. No S waves were recorded by the Benioff seismograph at all, and the maximum amplitude on the Milne-Shaw records was only 0.8 mm.

Text-figure 3 is a generalized geological map of this part of Queensland and text-figure 4 a more detailed geological map of the epicentral region. Examination and comparison of text-figures 1-4 leads to the following conclusions:

1. The epicentre was slightly north of Maryborough between latitudes  $25^{\circ}28'$  and  $25^{\circ}30'$  S and between longitudes  $152^{\circ}37'$  and  $152^{\circ}50'$  E., that is, about 70 miles due east of the epicentre of the Gayndah earthquake.

2. The intensity of the tremor was considerably less than that of the Gayndah earthquake—IV as against VI on the modified Mercalli scale.

3. The area of maximum apparent intensity, that enclosed by the isoseismal line IV, the only one definitely closed, is elongated in a north-south direction with the epicentre near the northern end.

4. A second area of similar, or possibly slightly greater, apparent intensity lies a little to the south around Nambour, but the isoseismal lines run out to sea without closing.

5. The isoseismals show a clear relationship to the geological structure of south-eastern Queensland.

- (a) Viewed as a whole they show an elongation in a N.N.W. direction, parallel to the trend of the palaeozoic rocks.

- (b) The epicentre is within the area of outcrop of the Lower Cretaceous rocks of the Maryborough district.

- (c) The whole of the more northerly area of maximum apparent intensity, except its most southerly end, is within the area affected by the Upper Cretaceous orogeny.

- (d) The elongation of the isoseismals, however, shows a considerable divergence from the direction of folding of the Cretaceous rocks ( $N.50^{\circ}W$ ).

6. It is thought that the position of the epicentre within the area disturbed by the Cretaceous folding, the most recent intense folding in Queensland, indicates an important relationship. The epicentre of the Gayndah earthquake was, however, about 30 miles to the west of the area affected\* by the folding.

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\*Reid (1926) however, suggested that the area affected by the folding was larger, and Gayndah lies on the western margin suggested by him (See also Bryan and Whitehouse 1938, p. 117).

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## DIRECTION OF VIBRATIONS.

Only fifteen replies were received to this question and the answers were quite inconsistent. Four said E.-W., four N.-S., four N.E.-S.W. and three S.E.-N.W.; of the four replies from Maryborough, two said N.E.-S.W. and two S.E.-N.W.; the direction of the four places, replies from which said E.-W., from the epicentre are N.N.E., S.W. (2), and S.E.

## EARTH SOUND.

Sixteen reports mentioned an earth sound, five before the tremor, five during the tremor, one before and during the tremor, one after the tremor and four did not particularize. No earth sound was heard at places where the intensity was less than III. The sound was described variously as "rumbling" (6 reports), a strong wind or gale (3), subsidence of mine working (2), blasting (2) and explosion underground (1).

## EFFECTS OF THE TREMOR ON PROPERTY.

No real damage was caused by the tremor. In Nambour a wireless aerial pole (a sapling) broke off at the stay about thirty feet above the ground. In areas of intensity IV or over, mirrors, blinds, curtains and kerosene lamp chimneys were dislodged and fell, windows and doors vibrated violently, crockery, etc. rattled, and hanging objects swung. The most common description was that it was like a heavy truck striking the building.

In areas in which the intensity was between III and IV, hanging objects swung slightly and in some cases crockery rattled. The most common descriptions were "like a heavy truck passing", or "like a train going by".

In areas of intensity II-III, there was a slight vibration of crockery etc., and the sensation was described either as a trembling or a distant rumbling.

## GEOLOGICAL SIGNIFICANCE.

Text-figure 4 shows the geology of the country about Maryborough, and the arc of the circle on which the epicentre lies, the most likely point being where a line joining Maryborough and Pialba cuts the arc of the circle.

Thus the epicentre is in the area of highly-folded Cretaceous beds, an area in which dips up to 80° occur.

Reid (1926, pp. 309-10) considered this folding to extend well beyond the Maryborough area—as far west as a line joining Gayndah and Beaudesert, between the 22nd and 28th parallels of latitude, and to be possibly as late as Middle Tertiary. In 1947 (p. 59) I pointed out that the Cretaceous beds are much more strongly folded than the Tertiary strata and suggested that there were two periods of folding, one in Upper Cretaceous times restricted to the Maryborough

area and approximately defined by the broken line in text-figure 3, and a later much slighter, but more widespread, folding in mid-Tertiary times.

This earth tremor, then, appears to have been due to readjustment within the most recently *strongly* folded strata in Queensland, whereas the Gayndah earthquake was due to readjustment along a fault line well to the west of this area.

#### ACKNOWLEDGEMENTS.

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MARYBOROUGH      DISTRICT

SCALE OF MILES

0 1 2 4 6 8

